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Usability of an Online Discussion Board

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Abstract— **An online discussion board called the Collab2learn Discussion Board (DB) enables participants' to learn collaboratively within groups. Groups are limited in using different feedback formats; either textual or iconic. 57 participants from an institute of higher learning tested Collab2learn DB usability. System Usability Scale (SUS) was used to measure Collab2learn DB usability. Its average scores were compared between two different feedback formats (textual and iconic). Results indicated Collab2learn DB is a usable online discussion board however further improvements need to be done especially in the prototype's functionalities integration and consistency.**

Index Terms— **Usability, online discussion board, System Usability Scale (SUS), Collab2learn Discussion Board**

I. INTRODUCTION

Computer applications via networking such as Curriculum Information Document Online System (CIDOS; http://www.cidos.edu.my) which was developed by Department of Polytechnic Education aims to support teaching and learning for polytechnics in Malaysia since the year 2010. Online discussion board application existed in CIDOS or any other online learning systems allow discussions, sharing knowledge and communication between learners and instructors possible at flexible time via online. A prototype called Collab2learn Discussion Board (DB) was developed to support current online learning environment and also to promote collaborative learning between learners within specified group. Collab2learn DB allows learners to discuss problems or issues related to workplace scenarios through online. Improving Collab2learn DB is important to ensure it is usable for learners to discuss collaboratively within their groups at specified functionalities.

Pertaining to the purpose of Collab2learn DB development, this study is focused with Collab2learn DB usability at different feedback format (textual and iconic).

II. LITERATURE REVIEW

A. Collaborative Learning Using Online Discussion Board Overview

Students interacting, working together and participate in group discussion conducting the same tasks to achieve common goal can be described as collaborative learning [1]. Collaborative learning implemented through online application such as discussion board, chat tool and social networking sites (eg. Facebook, Twitter, MySpace) is popular among learning institutes including higher learning institutes in many countries. Collaborative learning using online discussion board allow learners to not just interact academically with their classmates and instructors but also conduct sociocultural interactions with others

outside their learning institutes [2].

Nicenet Internet Classroom Assistant (http://www.nicenet.org/ICA/login.cfm) and ATutor Learning Management Tool (http://atutor.ca/) are example of online discussion board available in the internet focusing on the teaching and learning. Facebook (http://www.facebook.com) and Twitter (https://twitter.com/) are example of Social Networking Sites subscribed by users through the internet while phpBB Free Open Source Bulletin Board Software (https://www.phpbb.com/) is one of application to create an online bulletin board for any type of discussion. These online applications are accessible by users to communicate and interact with others in their flexible time as long there are network.

Online discussion board has been implemented in various learning institute to allow learners communicate and interact with others. Facebook and Twitter allows user to communicate and interact with others, however with various functionalities embedded in the social networking sites, it is hard to examine specific tasks within a controlled time thus easily maneuvered students concentration on specific problem. phpBB is cumbersome to apply because requires developers to reset for specific purpose and on specific tasks before being upload to a rental web server. Applications developed intelligent systems specific to their own technical subjects. Restricted installation based on personal computer requires technical person support in managing the system.

Currently, there is no online discussion board discussing on workplace scenarios implemented in polytechnics or community colleges in Malaysia. Curriculum Information Document Online System (CIDOS) allows students to share documents related to learning topics using multi format quiz (list box, check box (multiple choice or true/false) for assessment purposes, chat tool for synchronous communication and multithread forum for asynchronous communication [3]. Similar multithread forum is applied for e-learning at Universiti Science Malaysia (elearning@USM, http://www.elearrning.usm.my) whereby students are allowed to communicate with others and feedback is given in written format.

Lack of online discussion board developed with both asynchronous and synchronous communication type that allows reflective activity based on feedback to group members' contribution motivates the study to develop a prototype for online interaction and communication between students.

An online discussion board allows learners to share knowledge, participate in learning discussions and interact with others at their own time or given specific time [4 and 5] through online or networks. Comments, feedbacks and response from the instructor or other learners contribute to the learners understanding on specific issues. Collaborative learners would achieve certain understanding of knowledge from workable or usable online discussion board. This study focused to the usability of a developed online discussion board called Collab2learn Discussion Board.

B. Prototype Design and Development

i. Scope of Prototype

Proposed system called Collab2learn Discussion Board will support collaborative learning within online environment. Collab2learn Discussion Board is referred to 'Collaborative learning using discussion board'. The scope of Collab2learn DB is as below:

- System functionality: Collab2learn DB is divided in two (2) type of users; end users and administrator. End users are allowed to participate in online discussion and able to use only specific functions controlled by the administrator. Administrator has the control to register users, create groups and learning content; and control learning session period. This paper only explained end users functionalities and screen shots in Collab2learn Functionalities section.
- Prototype accessibility: Collab2learn DB is accessible through the network at http://www.collab2learn.net. However, only registered users within specific time are able to login Collab2learn.
- Questionnaire module: Questionnaires are displayed at the end of learning session for end users to answer items evaluating dependent variables. Administrator has the ability to view questionnaire summary answered by end users.

ii. Collab2learn Functionalities

End users or respondents are divided in groups created by administrator. Users are assigned into all female or all male groups. They are allowed to login using given id (refer Fig. 1) and participate in learning sessions. Instruction to use Collab2learn DB is displayed prior authorized login (refer Fig. 2). Each user has the ability give comments and suggestions related to workplace scenarios displayed on the interface. End users have the authority to give feedback through 'I Agree' or 'I Disagree' buttons. The buttons are created in two types: iconic for high rich and textual for low rich. Feedback to other users in the same group is allowed.

Communication type in Collab2learn DB is restricted by their synchronicity: synchronous/ real time communication and asynchronous/ not real time communication. Synchronous sessions are constraint within 60 minutes of learning sessions while asynchronous sessions are constraint by 7 days/168 hours. (refer Fig. 3 and 4). Time is displayed in counted down format and if the time is over, time out notification appears and request users to continue with questionnaire session (refer Fig. 5). Users are allowed to continue with questionnaire if they have finished discussing all the scenarios.

Thank you notifications will appear after finish answering all the questions and users will log out to end their learning session (refer Fig. 6).
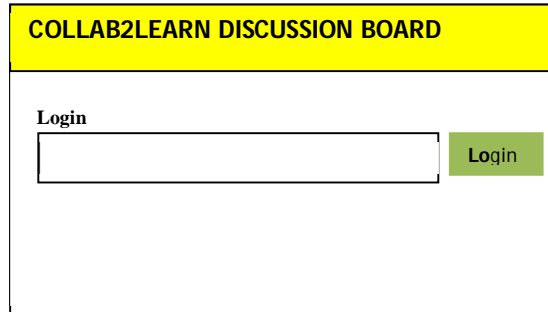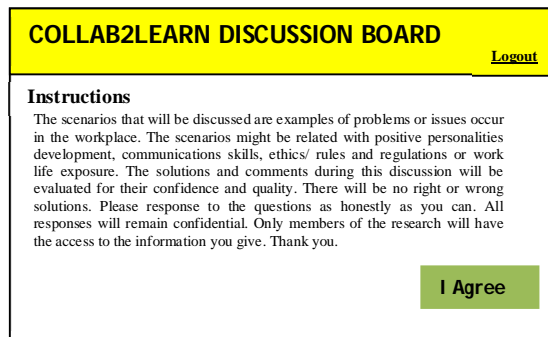
COLLAB2LEARN DISCUSSION BOARD

Login

[   ] **Login**

Figure 1. Login interface

COLLAB2LEARN DISCUSSION BOARD   Logout

Instructions

The scenarios that will be discussed are examples of problems or issues occur in the workplace. The scenarios might be related with positive personalities development, communications skills, ethics/ rules and regulations or work life exposure. The solutions and comments during this discussion will be evaluated for their confidence and quality. There will be no right or wrong solutions. Please response to the questions as honestly as you can. All responses will remain confidential. Only members of the research will have the access to the information you give. Thank you.

I Agree

Figure 2. Instructions to participate in Collab2learn DB

COLLAB2LEARN DISCUSSION BOARD
                              37 minute(s) remaining   Logout

Type 2
You are in your break walking towards …………………………………….. ……………………………………………………………..……………………

Question:
What is …………………………………..?

[   ]   Next scenario

Add comment

1.   I don't really agree with this
      Posted by: Ali on June 30, 2012 10:30:12
      😺😹

Figure 3. Example for synchronous and iconic learning session in Collab2learn Discussion Board

C. System Usability

User interface is focused on the user interaction and experiences for products not only related to computer applications such as computer websites, computer appliances and software applications, but to any applications users interact with control or display [6]. Design on the user interface requires developer to plan user interaction that is simple and efficient. Good design on the user interface will contribute to greater user
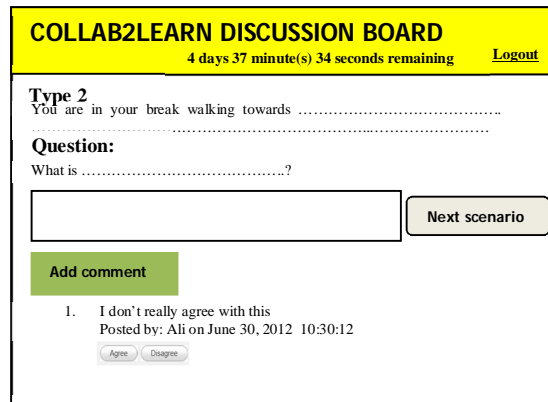
COLLAB2LEARN DISCUSSION BOARD

4 days 37 minute(s) 34 seconds remaining　　Logout

Type 2
You are in your break walking towards …………………………………..
……………………………………………………………...…………………….
Question:
What is …………………………………..?

[　　　　　　　　　　]　[Next scenario]

[Add comment]

1.　I don't really agree with this
　　Posted by: Ali on June 30, 2012　10:30:12
　　(Agree) (Disagree)

Figure 4: Example for asynchronous and textual learning session in Collab2learn Discussion Board

COLLAB2LEARN DISCUSSION BOARD

Type 2
You are in your break walking towards …………………………………..
……………………………………………………………...…………………….
Question:
What is …………………………………..?

Your time has ended. Redirecting you to questionnaire. Thank you.

OK

[Add com…]

1.　I don't really agree with this
　　Posted by: Ali on June 30, 2012　10:30:12
　　(Agree) (Disagree)
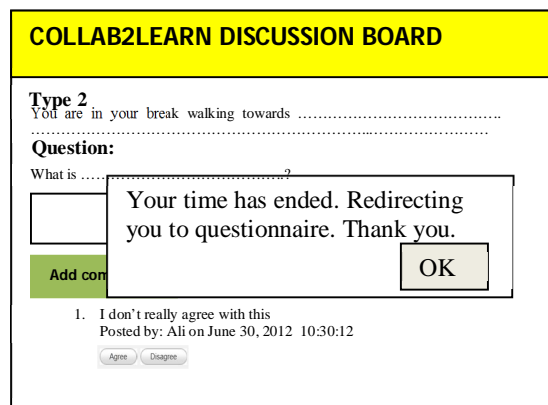
Figure 5: Time out notification to notify the time is over and questionnaire session will begins

COLLAB2LEARN DISCUSSION BOARD

Logout

Thank you for participating in Collab2learn Discussion Board. If you are interested with this research result, please contact us. Thank you.

[End]
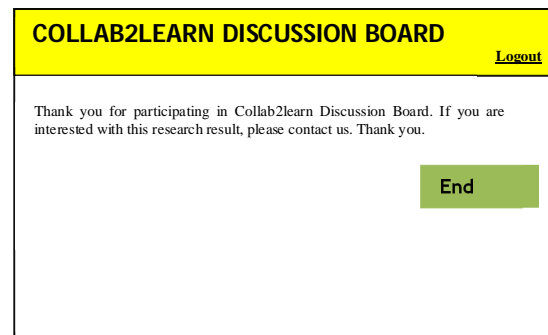
Figure 6: Thank you notification to users for their participation during learning session and questionnaire session

acceptance, usable and accepted to the marketplace. The goal in good interface design is easy to understand, easy to use and easy to learn.

Usable is described as the view of appropriateness of a product or a tool to achieve specified goals with effectiveness, efficiency and satisfactory to specified users [7]. Usability of a tool or a system is unique at its own context or situation [8 and 9] such as for industrial context, educational context or everyday-general household context. A usable system is useful and easy to learn contains the right content and meet the specified requirements and user's satisfaction [10].

Designing a usable system is an iterative process from the users scope, user testing phases (simulations and prototype, measures performance), developers modified the system based on user testing measurements and finally integrates all system's usable functions in parallel and specified goal [10] identified by system

developers. Modifies the system and making changes according to testing results is an iterative process until the systems meets the requirements [11]. Gould (2004) described a reliable system with appropriate response time and systems that work to the specified functions with suitable user interface are aspects to cater during developing and designing a system.

Easy to learn and use with well integrated functionalities are essential for a system to be usable [6, 12 and 13]. System's manual or outreach/ training programs are important to support end users learnability. A satisfactory usable system contains workable specified functions, easy to learn and use at appropriate response time.

D. System Usability Scale

Usability test is important to test ease of use and learnability of a system. A usable system or a tool is viewed from its appropriateness to the context or situation [8] and achieved specified goals with effectiveness, efficiency and satisfactory to specified users [7]. The context for a system can be varied from industrial context, educational context, banking context or general context [9, 13, 14 and 15]. In other words; where the system would be used will determine either the system is usable for that specific context or not meeting the requirements.

System Usability Scale (SUS) was developed in 1986 by John Brooke as an alternative instrument to measure system's usability suitable to its environment. The ten-item questionnaires were designed based on global view of subjective assessments of usability [12 and 15]. The scale measure ease of use for a system and using the same scale, other related system from other country is possible to be compared. Though SUS is often known as 'quick and dirty' scale, it has been widely used to various global context related to systems usability specifically computer system such as company websites, database application and computer programs that involved with users [8 and 12].

This study explored online discussion board usability within collaborative learning sessions. Two groups experimented the prototype at different feedback formats; textual and iconic. Both groups explored all functionalities including textboxes, buttons and icons. SUS questionnaires were distributed to all participants. Reliability analysis results and average scores between both tests were explored to satisfy authors' enquiry with lower reliability results compared to other study using the same scale [7, 9, 14 and 15].

III. METHOD

A. Research Design

This research was design for experimental study on selected participants. A developed prototype called Collab2learn Discussion Board was used as the external tool for collaborative learning sessions. Several workplace scenarios were designed as the learning content. Participants communicate and discuss within their group on questions given based from the scenarios. Analyses were conducted from electronic questionnaire completed by participants at the end of learning session or their discussions.

B. Research Objective

The research objective for this study is "To test a prototype usability using SUS questionnaire at different sessions based on the prototype's functionalities".

C. Sampling

Total of 57 participants were selected from an institute of higher learning. All participants had basic knowledge of using online discussion board. Participants were assigned to groups with different prototype functionalities. 28 participants experimented textual feedback format and 29 participants experimented iconic feedback format.

D. Experimental Procedure

Experimental procedure for Collab2learn usability testing was conducted for independent participants in different sessions. Participants were divided into two types of groups (textual feedback format and iconic feedback format). Each participants will independently login to the same online discussion board (http://www.collab2learn.net) using their given ID.

All participants were required to explore prototype functionalities according to its function. Participants were divided into groups to experiment Collab2learn DB at different feedback formats (textual or iconic). Usability test was conducted to the Collab2learn DB usability to 57 participants and was measured by SUS

scale. Independent participants were selected and measuring instruments were given at the end of discussion sessions.

Selected participants log-in to Collab2learn Discussion Board web site using their given ID. Workplace scenarios were displayed and participants were allowed to give comments and click button 'Add Comment'. All comments were displayed below the comment's textbox. Participants were allowed to 'Agree' or 'Disagree' their group members' comments excluding their own. Buttons 'Agree' and 'Disagree' were displayed either in textual or iconic format (refer Fig. 7A and 7B)

Nicknames were assigned to each participant and they are allowed to give comments more than once for each scenario. Participants were allowed to answer the questionnaire either if they are tested all functionalities or if the time allocated was up. At the end of testing session, they were instructed to test and explore all functionalities including textboxes, buttons and icons. At the end of testing sessions, all participants will answer a 10-items questionnaire to measure Collab2learn usability.

Figure 7(A). Textual feedback format button.
Figure 7(B). Iconic feedback format button.

E. Questionnaire Design

Electronic questionnaire will automatically generate at the end of learning session for each participants. Participants are allowed to answer several times, but only the latest answer will be used for further analysis. Questionnaire designed to measure dependent variables for the experimental study. 6-point Likert scale (1- Really disagree, 2- Mostly disagree, 3- Disagree a little, 4- Agree a little, 5- Mostly agree and 6- Really agree) contained 10-items System Usability Scale [8, 12, 15 and 16] was used to measure Collab2learn usability. Both test consisted five of items which are positive and five items that are negatively worded. Item 1 to Item 5 are positive worded and Item 6 to Item 10 are negative worded. Examples of the items are as follows:

Item 1: "I think I would like to use this system frequently".
Item 2: "I thought the system was easy to use".
Item 6: "I found the system unnecessarily complex".
Item 8: "I thought there were too much inconsistency in this system".

F. Reliability Analysis

Reliability for internal correlations between 10-items was calculated based on Cronbach's Alpha measurement. Internal consistency for usability calculated acceptable reliability of $\alpha = 0.757$ [15]. Higher results reliability of $\alpha = 0.91$ were discovered by previous researchers [8 and 12]. Dillenbourg et al. (2008) described participants in groups contributed to biasness during solving tasks however [15] described items internal consistency of 0.7 and above is acceptable.

IV. RESULT AND DISCUSSIONS

The research objective for this study is 'To test a prototype usability using SUS questionnaire at different sessions based on the prototype's functionalities'. The usability of the prototype was explored. Analysis comparing with average scores in 10-items SUS for Collab2learn DB for different feedback format (N=57; Textual=28 and Iconic= 29) were held using SPSS 13.0 [17].

Almost 85% participants agree to use Collab2learn frequently, however approximately; only 12% participants disagree a little with the thought of using Collab2learn frequently. This has shown, most participants agreed to use Collab2learn frequently with small number of disagreement from the participants. Textual feedback format carried lower average (Mean= 4.18, SD= 1.188, Median= 4.00) compared to iconic feedback format (M= 4.55, SD= 0.870, Median= 5.00). Higher participants from iconic feedback agreed to use Collab2learn frequently compared with textual feedback format (refer Fig. 8A).

The result has shown that 37% participants agree the most and 33% participants strongly agree with the thought Collab2learn was easy to use. This reflected that the majority agreed Collab2learn was easy to use with only 12% disagree Collab2learn was easy to use. Similar average scores between textual (Mean= 4.86,

SD= 1.177, Median= 5.00) and iconic (Mean= 4.83, SD= 1.197, Median= 5.00) feedbacks formats with the agreement that Collab2learn was easy to use (refer Fig. 8B).
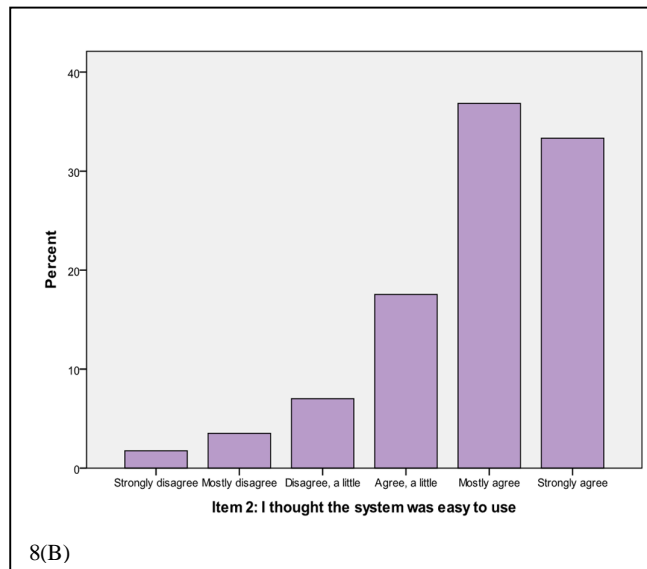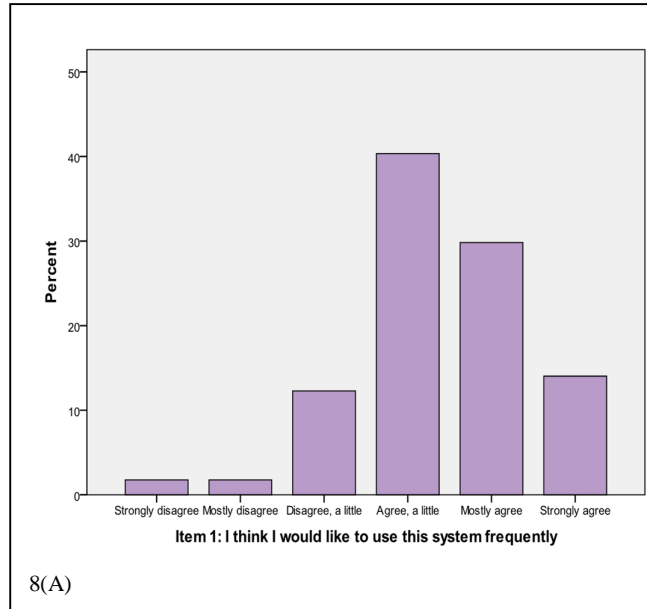

8(A)

8(B)

Figure 8A. Collab2learn result for frequent usage.
Figure 8B. Colalb2learn result for ease of use

Approximately 80% participants found that the functions in Collab2learn were well integrated. Only 20% participants found the functions were not really well integrated. Textual feedback format (Mean= 4.32, SD= 0.983, Median= 4.00) carried lower agreement with Collab2learn functionalities integration compared to iconic feedback format (Mean= 4.38, SD= 1.015, Median= 5.00) (refer Fig. 9A).

86% participants agree that most people would learn to use this system very quickly, however approximately 5% participants strongly and mostly imagine that Collab2learn was not easy to learn. This reflected Collab2learn is easy to learn for majority of participants. Participants in iconic feedback format (Mean= 4.72, SD= 1.131, Median= 5.00) agreed more that most people would learn to use Collab2learn very quickly compared to textual feedback format (Mean= 4.54, SD= 1.071, Median= 5.00) (refer Fig. 9B).
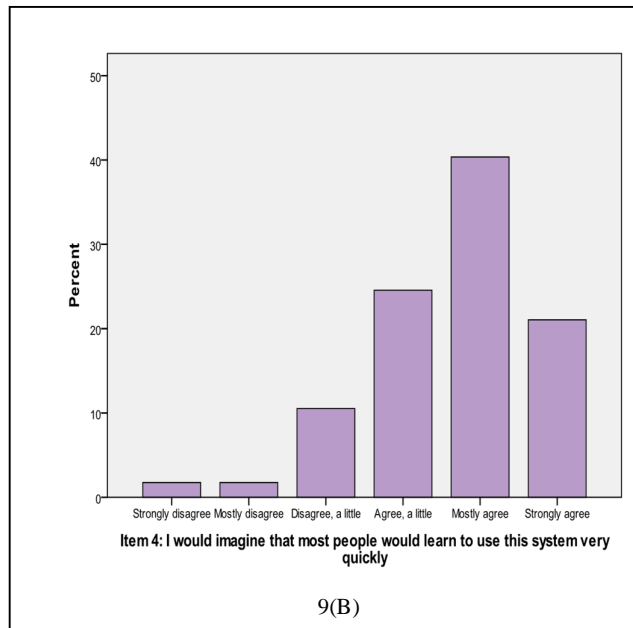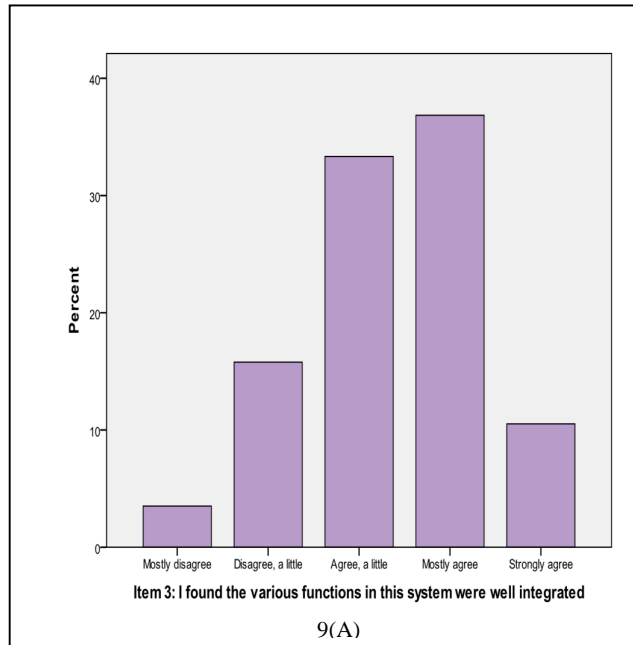
9(A)

9(B)

Figure 9A. Collab2learn result for functionality integration
Figure 9B. Collab2learn result for system's learnability to most people

Only 14% participants not really feel very confident to use Collab2learn. 86% participants felt very confident using Collab2learn. None from both iconic and feedback format don't feel very confident using Collab2learn. Textual feedback format (Mean= 4.68, SD= 0.983, Median= 5.00) carried lower scores to use Collab2learn confidently compared to iconic feedback format (Mean= 4.83, SD= 1.071, Median= 5.00) (refer Fig. 10A). Approximately 89% participants agree with the system functionalities was complex unnecessarily. Only 11% does not found Collab2learn was not complex. Textual (Mean= 4.54, SD= 1.138, Median= 4.50) feedback format found that Collab2learn was unnecessarily complex more than iconic (Mean= 4.38, SD= 0.979 Median= 4.00) feedback format (refer Fig. 10B).

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Observation during testing session discovered several participants were biased in scores. Contradict results were discovered for system's consistency; Item 3 & 8, easy to use; Item 2 & 7 and system's learnability; Item 4 & 10. It was discovered that participants chose higher score points for all items even though item 2, 3 and 4 are positive worded while item 7, 8 and 10 are negative worded questions. They were influenced by others scores especially when participated in group discussions among participants attitude [1]. Students were observed to discuss quietly among themselves during answering the questionnaire. This reflected research conducted in group discussions that requires them to answer questionnaires individually should be monitor strictly by the instructors.
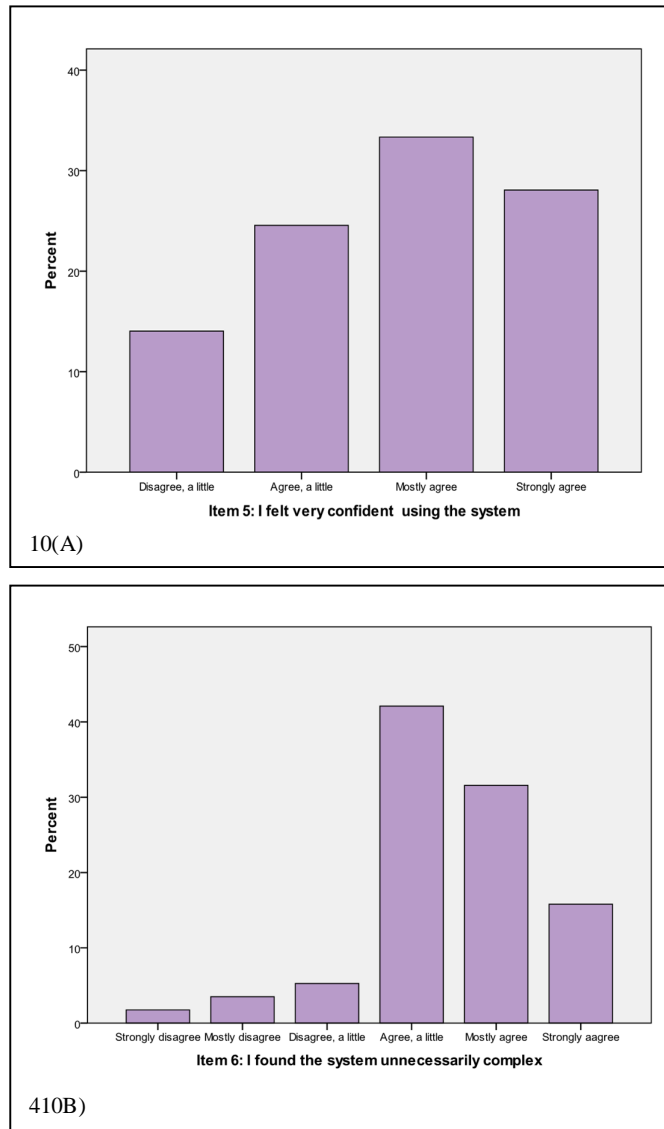

10(A)

410B)

Figure 10A. Collab2learn result for confident to use
Figure 10B. Collab2learn result for system's complexity

Approximately 89% participants thought they need support from technical person to be able to use this system. Higher number of iconic (Mean= 4.83, SD= 0.889, Median= 5.00) feedback format agreed that technical person was needed compared to textual (Mean= 4.50, SD= 1.319, Median= 4.00) feedback format (refer Fig. 11A).

Approximately 70% participants thought there were too much inconsistency in Collab2learn, however, only 5% participants strongly disagree with Collab2learn's inconsistency. Both textual (Mean= 4.21, SD= 1.197, Median= 4.00) and iconic (Mean= 4.10, SD= 1.448, Median= 4.00) feedback format have similar agreement with the thought there was too much inconsistency in Collab2learn (refer Fig. 11B).

Interrupted internet connection during testing session has contributed to inconsistency and feeling of awkwardness (refer Fig. 8A) pertaining lack of response time [7 & 9]. Appropriate response time was important for a system to be usable. The interrupted mood contributed to participants' judgment that Collab2learn was inconsistent and complex though the functions were well integrated and easy to use by some participants [10].
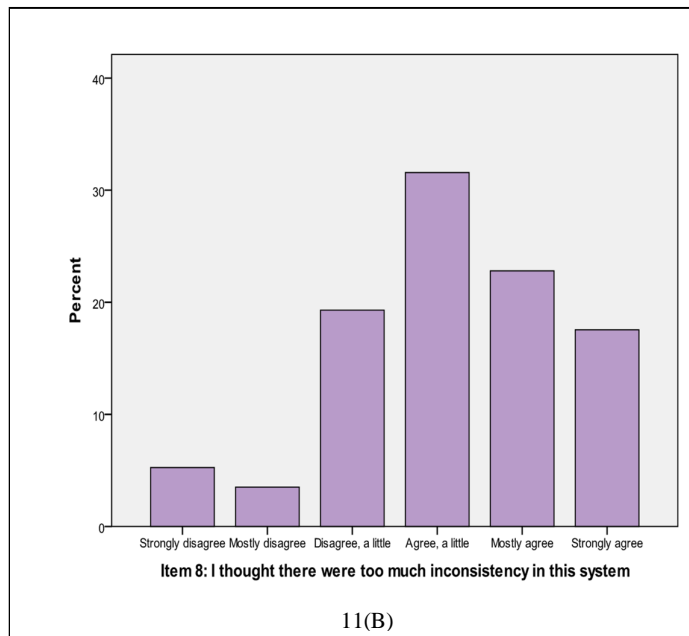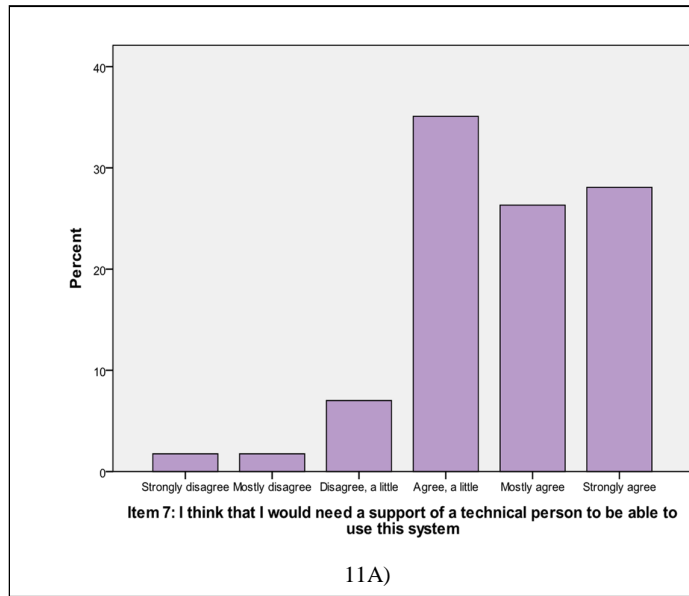

11A)

11(B)

Figure 11A. Collab2learn result for technical support
Figure 11B. Collab2learn result for system's inconsistency

Approximately 25% participants found the system was not awkward to be used, however 75% participants found that Collab2learn was very awkward to be used. Higher scores from textual (Mean= 4.39, SD= 1.031, Median= 4.00) feedback format thought Collab2learn was awkward to use compared from iconic (Mean= 4.10, SD= 1.398, Median= 4.00) feedback format (refer Fig. 12A).

Only 12% participants mostly and strongly disagree that they need to learn a lot before using Collab2learn. More than 40% mostly and strongly agreed that they needed to learn a lot of things before using Collab2learn. Higher number from iconic (Mean= 4.45, SD= 1.378, Median= 5.00) feedback format agreed that they needed to learn a lot before using Collab2learn compared to textual (Mean= 3.98, SD= 1.499, Median= 4.00) feedback format disagreed that they needed to learn a lot before using Collab2learn (refer Fig. 12B).
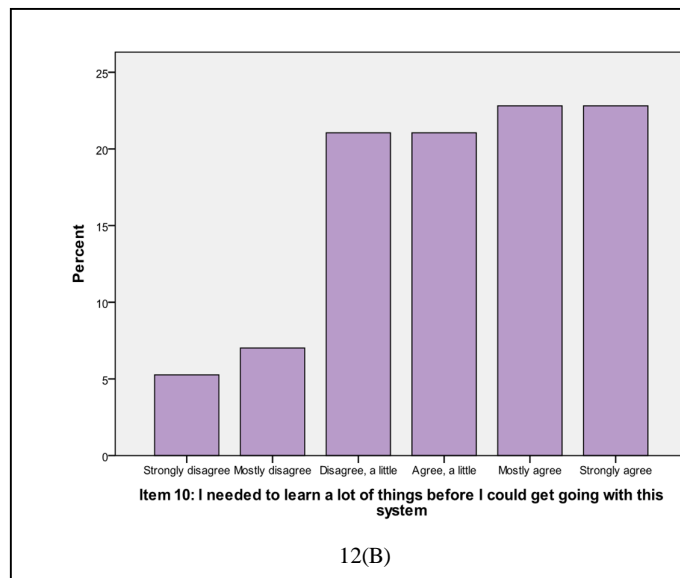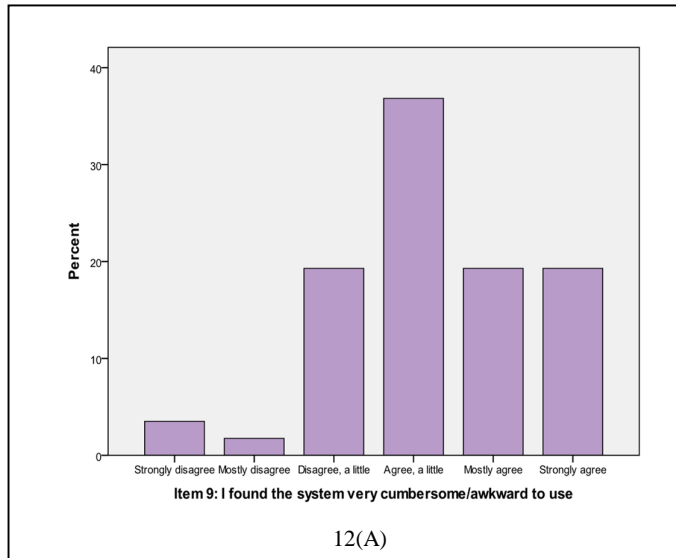

12(A)

12(B)

Figure 12A. Collab2learn result for system's usage awkwardness
Figure 12B. Collab2learn result for system's learnability before it is able to use

V. CONCLUSIONS

Collab2learn Discussion Board generally is usable as communication platform whereby students can participate in collaborative learning, give comments and feedback to their group members. Overall, Collab2learn carried positive scores (4.00 and above) to both textual and iconic feedback formats. Both textual and iconic feedback formats scored were reliable as the mean and median scores were not much different [17].

Technical improvements need to be done especially on the system's accesses and multiple comments submission during offline period. Ability to access systems' contents and functionality; and 'keyed-in' comments are saved even during the offline period will certainly improve system's usability. Technical issue observed during the testing session influenced scores to the ease of use and system consistency even though they are confident and learn to use Collab2learn very quickly. Leavitt & Shneiderman (2006) in *Research-based Web Design and User Guideline* described iterative process in testing and modifies based on the testing results will increased product efficiency thus prevent mistakes and cost effective.

A. Future Works

Currently, Colllab2learn can be accessed through network and it is constrained to the internet connectivity. The 'downtime' or 'offline' contributed to low usability measurements. Authors need to improve with Collab2learn functionality because users are required to submit comments several times when the network is down. It is suggested to improve with the installation or technical distributions of Collab2laern for users. Management issues during conducting testing sessions and instructing users from beginning till questionnaire also need to be improved. Instructions for students' participating group discussion need to be clear and monitored by the instructors to lessen biasness attitude among participants.

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